

# Light Measurement Report

Print date: 19-12-2024

Measurement date and time: 19-12-2024 09:20:36 – Measurement no. VFR-241219-2589-MS

Measurement tracking No. and Link: [VT241219-001483](https://www.viso-systems.com/VT241219-001483)

Operator:



## Laboratory and Equipment

Laboratory Owner and Location  
Goniospectrometer System and Type  
Sensor Name, Calibr. Date and Serial No.  
Spectrometer Manufacturer and Model

Viso Systems, Copenhagen V, Denmark  
LabSpion – Type C, horizontal  
LabSensor Model2 – 11-1-2024 – 3130191315  
Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

## Measurement Conditions

Number of C-planes and Resolution  
 $\gamma$  (gamma)-Resolution  
Test Distance  
Input Power, Power and Displ. Factors  
Input RMS Voltage and Current  
Frequency of Input Power  
Warm-up Time and Variation

12 planes – 30°  
5°  
7,71 m  
41,7 W – PF 0,96 – DPF 0,97  
230 V – 0,188 A  
50 Hz  
Lamp stabilized in 15 min 1 sec – 2,0%

## Tested Light Source

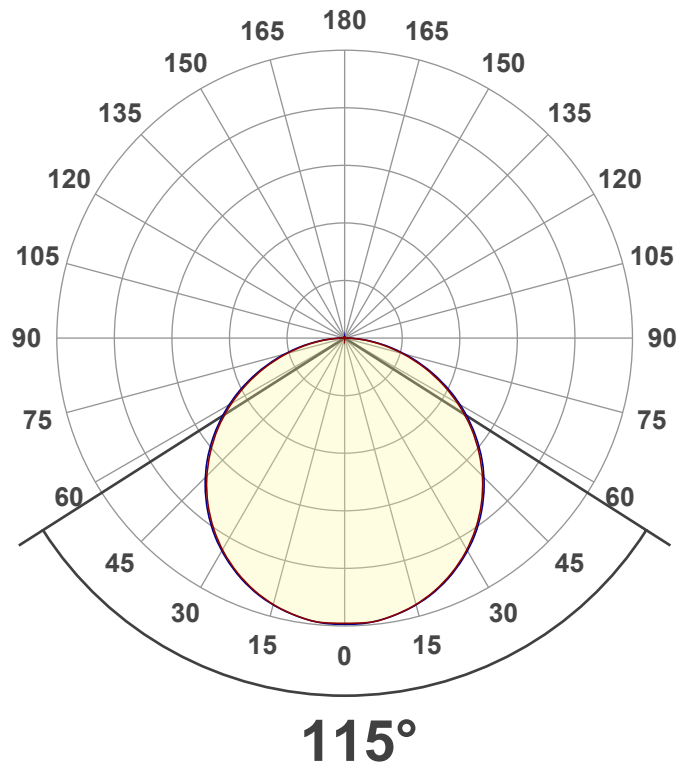
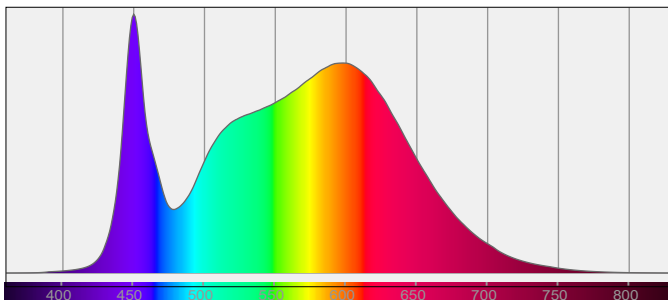
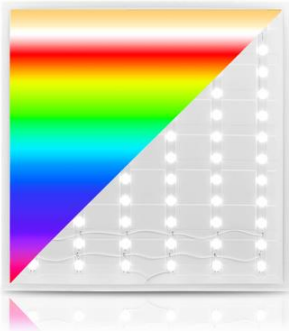
Product Name  
Item No. and Manufacturer  
Product Description (line 1)

808198-4000K  
808198-4000K – Dutchfulfillment  
BACK-LIT LED PANEEL | DOVER | 60x60CM | RGB+CCT | 40W

## Main Light Measurement Results

Output – Total Lumen (Up% / Down%)  
Efficiency  
Peak Intensity and Beam Angle  
Correlated Color Temperature, Target/Measured  
Color Rendering Index  
Color Rendering TM30-18  
Color Shift, CIE duv and MacAdam Steps  
Flicker

4080 lm – 0,58% / 99,42%  
98 lm/W  
1368 cd – 115°  
CCT = 4000 K / 4113 K  
CRI 85,7  
 $R_f$  85,9 –  $R_g$  96,8  
Duv 0,0006 – SDCM 2,4  
SVM 0,01 – PstLM 0,01



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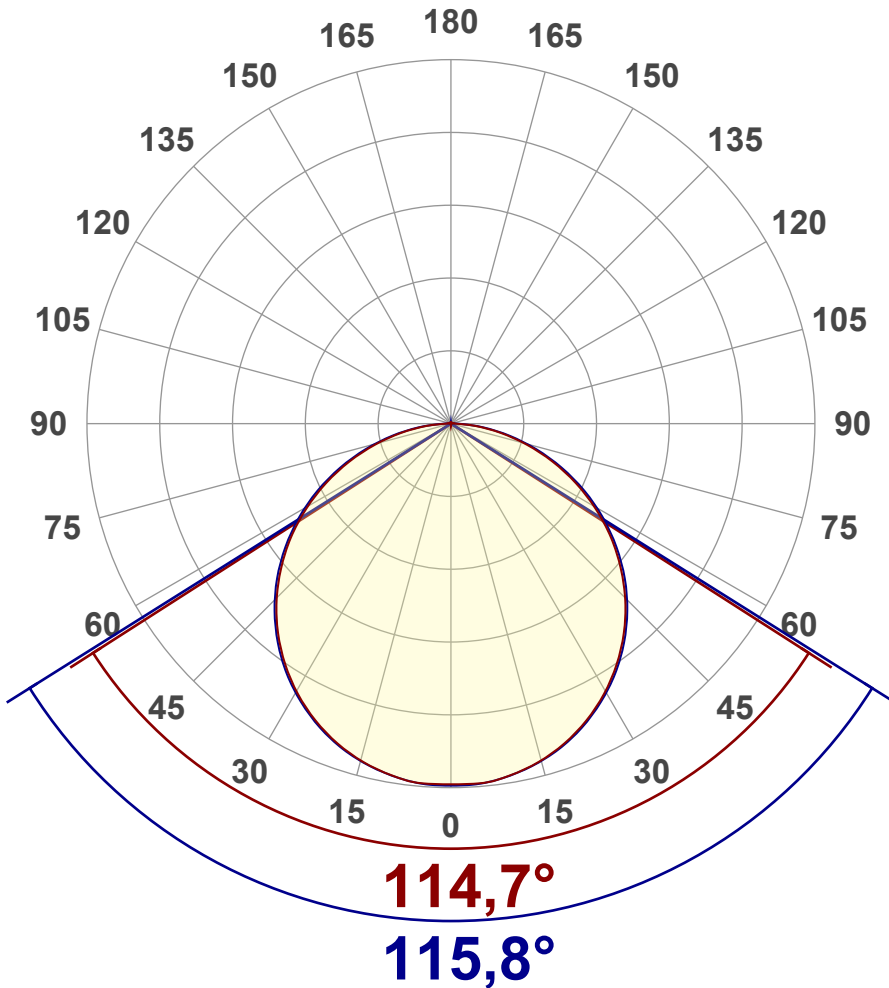
Measurement tracking No. and Link: [VT241219-001483](#)

Operator:



## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

Output (total Lumen)	4080 lm
Lumen Up% / Down%	0,58% / 99,42%
Peak Intensity	1368 cd
Beam Angle (50%)	115°
Beam Angle (90%)	115,8°
Beam Angle (10%)	114,7°

## Cut-off Angle

Average 2,5%	177,3°
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## Field Angle

Average 10%	164,9°
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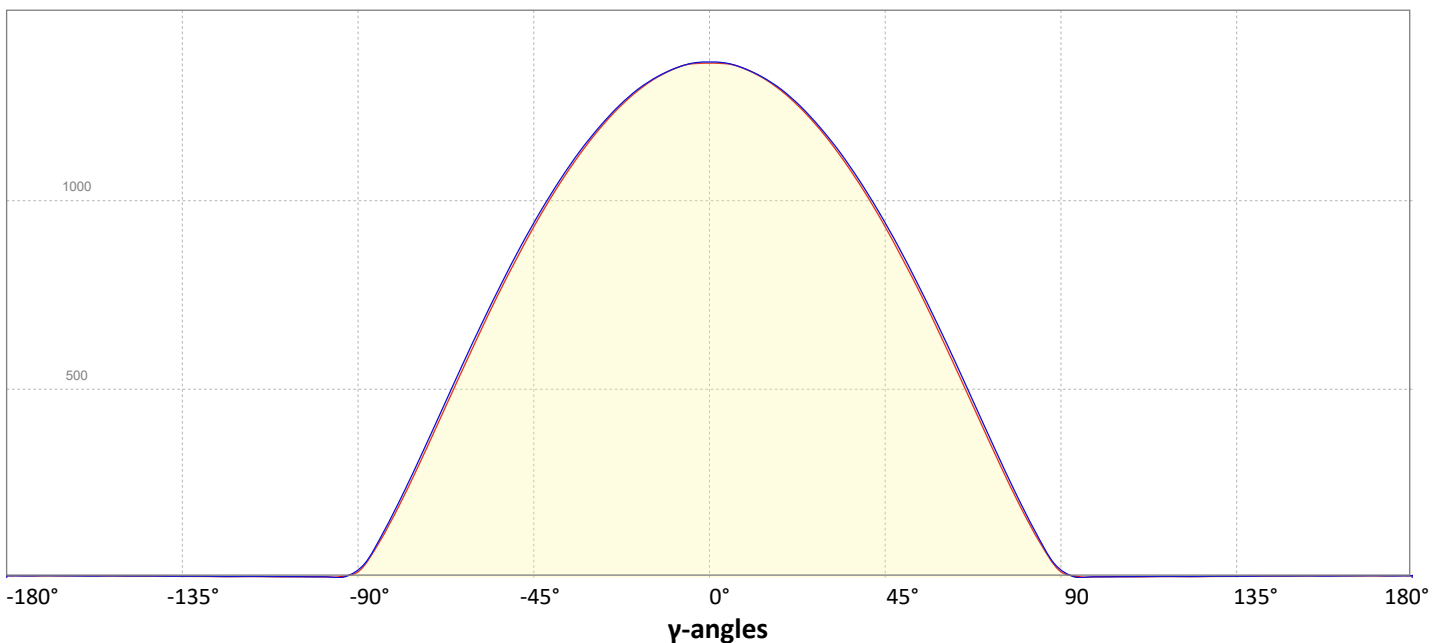
## Intensity Ratio

In 120° cone	76,9%
In 90° cone	51,9%

**C000-C180**

**C090-C270**

## Linear distribution diagram - Intensity (candela) vs $\gamma$ -angle



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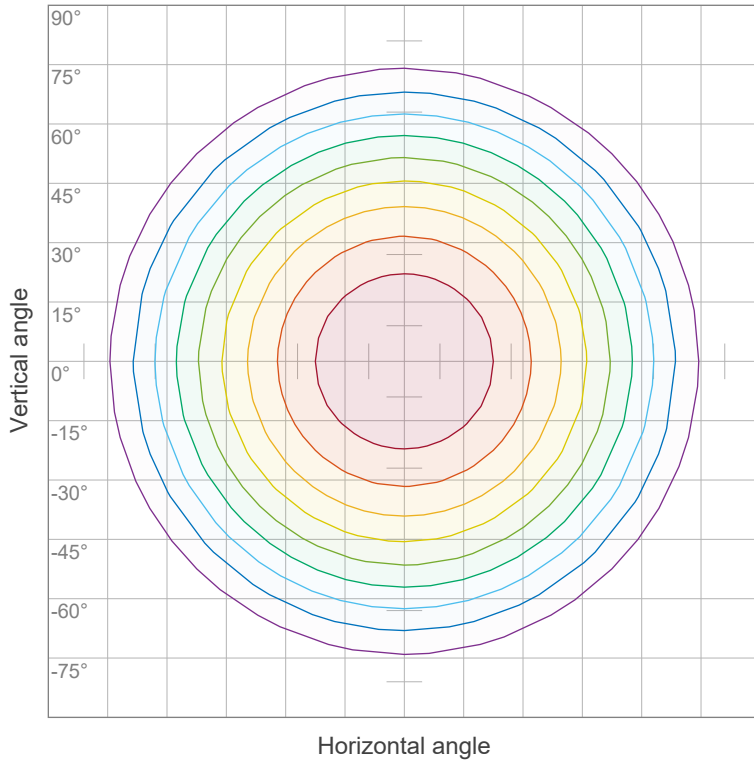
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## Iso-intensity Diagram (Iso-candela)

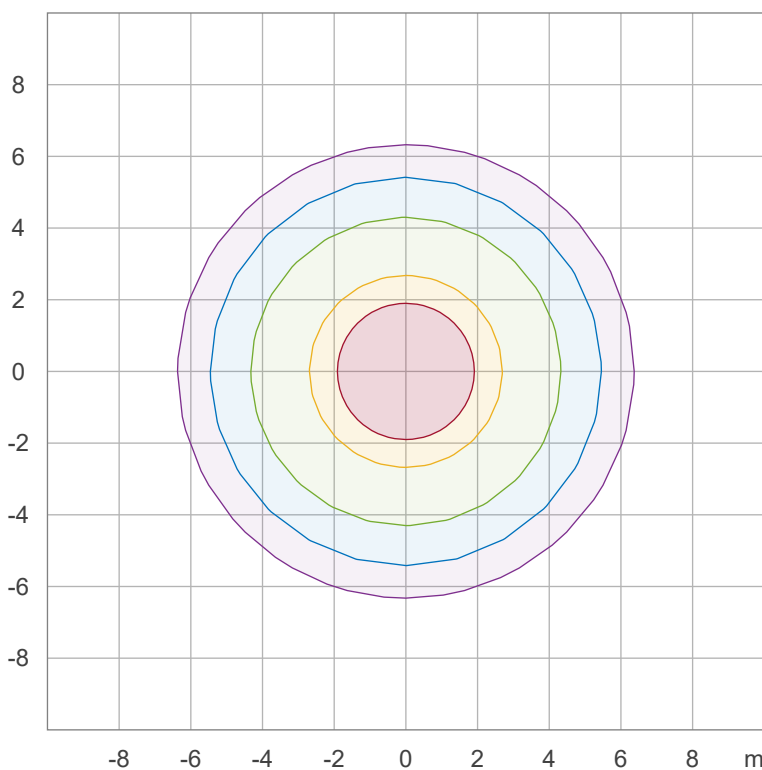


90 %	1231,2 cd
80 %	1094,4 cd
70 %	957,6 cd
60 %	820,8 cd
50 %	684,0 cd
40 %	547,2 cd
30 %	410,4 cd
20 %	273,6 cd
10 %	136,8 cd

Peak intensity: 1368,0 cd

Number of c-planes: 12

## Iso-illuminance Diagram (Iso-lux)



50,0 %	76,0 lx
30,0 %	45,6 lx
10,0 %	15,2 lx
5,0 %	7,6 lx
3,0 %	4,6 lx

Peak illuminance: 151,9 lx

Mounting height: 3,0 m

Number of c-planes: 12

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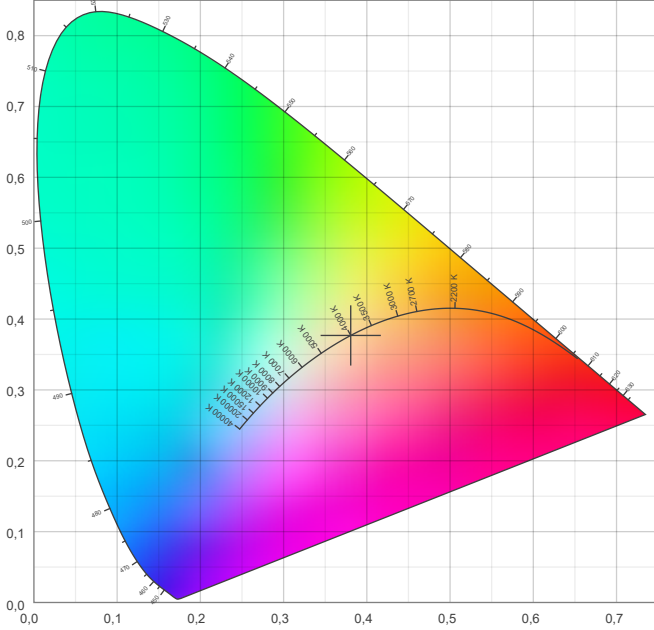


## Color details

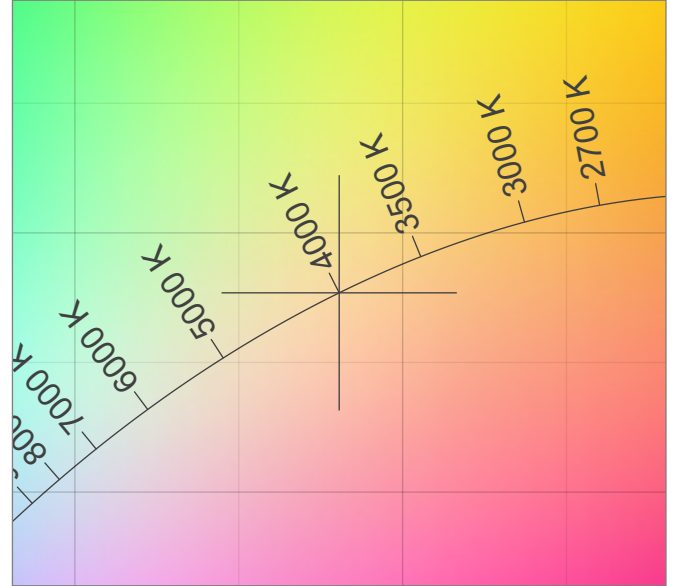
Correlated Color Temperature, Target CCT = 4000 K  
 Correlated Color Temperature, Measured CCT = 4113 K  
 Color Rendering Index CRI 85,7  
 Color Rendering Index, R9 (red component) R9 = 20,3  
 Color Rendering TM30-18 R<sub>f</sub> 85,9 – R<sub>g</sub> 96,8  
 Color Quality Scale CQS = 84,9

MacAdam Steps SDCM = 2,4  
 Color coordinates CIE 1931 (x;y) = (0,381;0,377)  
 Color coordinate CIEs 1960 (u;v) = (0,225;0,334)  
 Color deviation from BBL Duv = 0,0006  
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

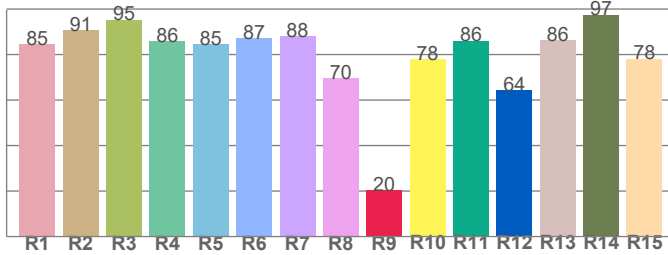
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



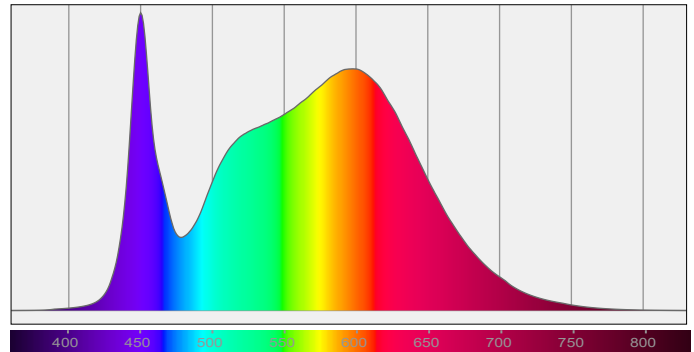
### Color Rendering Index per reference color (CIE 1995)



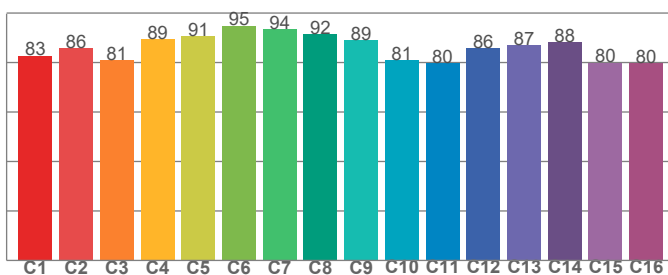
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84,6	90,7	95,2	85,9	84,6	87,1	88,0	69,6	20,3	77,9	86,0	64,2	86,3	97,5	78,2

### Spectral power distribution (SPD) / W/nm – 0-100%



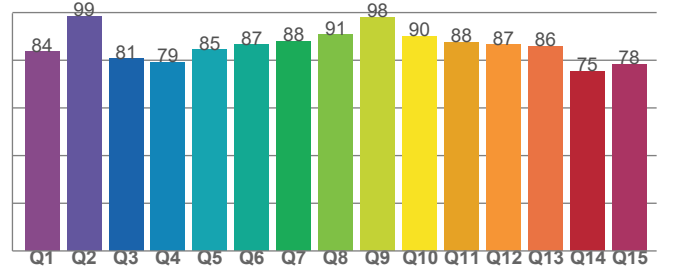
### TM30-18 R<sub>f</sub>-values per hue bin



TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
82,7	85,9	80,8	89,3	90,6	94,8	93,6	91,5	88,9	81,0	79,7	85,8	86,9	88,2	79,9	79,6

### Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
83,5	98,6	80,7	79,1	84,5	86,5	87,9	90,6	98,0	90,1	87,7	86,5	86,0	75,4	78,4

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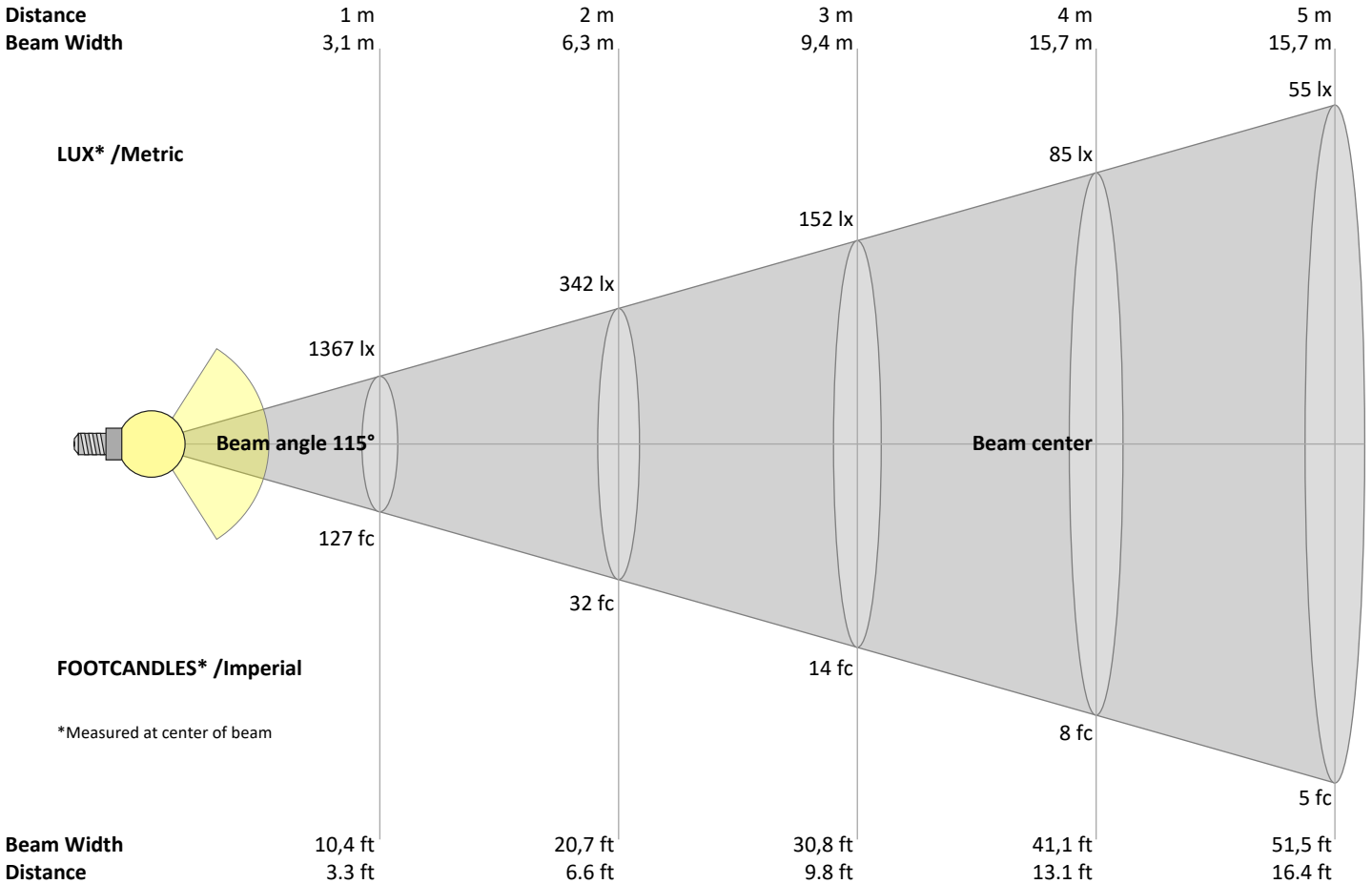
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## Beam Details



### Beam intensities from 1 – 20 m

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	m
3,3	6,6	9,8	13,1	16,4	19,7	23	26,2	29,5	32,8	36,1	39,4	42,7	45,9	49,2	52,5	55,8	59,1	62,3	65,6	ft
1367	342	152	85	55	38	28	21	17	14	11	9	8	7	6	5	5	4	4	3	lux
127	31,7	14,1	7,9	5,1	3,5	2,6	2	1,6	1,3	1	0,9	0,8	0,6	0,6	0,5	0,4	0,4	0,4	0,3	fc

### Intensities in 0° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1367	1361	1345	1316	1277	1227	1167	1097	1018	930	834	732	624	512	399	287	181	88	18	3	cd
100%	100%	98%	96%	93%	90%	85%	80%	74%	68%	61%	54%	46%	37%	29%	21%	13%	6%	1%	0%	of 0°val

### Intensities in 90° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1367	1362	1345	1318	1280	1231	1172	1104	1026	940	846	744	637	525	412	299	192	95	26	3	cd
100%	100%	98%	96%	94%	90%	86%	81%	75%	69%	62%	54%	47%	38%	30%	22%	14%	7%	2%	0%	of 0°val

### Intensities in 180° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1367	1361	1345	1316	1277	1227	1167	1097	1018	930	834	732	624	512	399	287	181	88	18	3	cd
100%	100%	98%	96%	93%	90%	85%	80%	74%	68%	61%	54%	46%	37%	29%	21%	13%	6%	1%	0%	of 0°val

### Intensities in 270° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1367	1362	1345	1318	1280	1231	1172	1104	1026	940	846	744	637	525	412	299	192	95	26	3	cd
100%	100%	98%	96%	94%	90%	86%	81%	75%	69%	62%	54%	47%	38%	30%	22%	14%	7%	2%	0%	of 0°val

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## Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances		70	70	50	50	30	70	70	50	50	30
	ρ Ceiling	70	70	50	50	30	70	70	50	50	30
	ρ Walls	50	30	50	30	30	50	30	50	30	30
	ρ Floor	20	20	20	20	20	20	20	20	20	20
Room size		Viewed Crosswise					Viewed Endwise				
H = mounting height above eye level		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
X	Y										
2H	2H	17,5	18,7	17,7	19,0	19,3	17,6	18,8	17,8	19,1	19,4
	3H	19,0	20,3	19,4	20,6	20,8	19,1	20,4	19,5	20,7	20,9
	4H	19,7	20,9	20,1	21,2	21,4	19,8	21,0	20,2	21,3	21,6
	6H	20,2	21,3	20,6	21,6	22,0	20,4	21,5	20,7	21,8	22,2
	8H	20,4	21,5	20,8	21,8	22,2	20,6	21,6	20,9	22,0	22,4
	12H	20,5	21,5	20,9	21,9	22,3	20,7	21,7	21,1	22,1	22,5
4H	2H	18,1	19,3	18,5	19,6	19,9	18,2	19,4	18,6	19,7	19,9
	3H	19,9	21,0	20,3	21,3	21,8	20,0	21,1	20,4	21,4	21,9
	4H	20,7	21,6	21,1	22,0	22,6	20,8	21,7	21,2	22,1	22,7
	6H	21,3	22,2	21,8	22,6	22,9	21,4	22,3	21,9	22,7	23,1
	8H	21,5	22,3	22,0	22,7	23,1	21,7	22,5	22,2	22,9	23,3
	12H	21,7	22,4	22,2	22,8	23,3	21,9	22,6	22,4	23,0	23,5
8H	4H	21,0	21,8	21,5	22,2	22,6	21,1	21,9	21,6	22,3	22,7
	6H	21,8	22,4	22,3	22,9	23,4	21,9	22,5	22,4	23,0	23,6
	8H	22,1	22,7	22,6	23,2	23,9	22,3	22,8	22,8	23,3	24,0
	12H	22,4	22,8	23,0	23,3	24,0	22,5	23,0	23,1	23,5	24,1
12H	4H	21,0	21,7	21,5	22,1	22,6	21,1	21,8	21,6	22,2	22,7
	6H	21,9	22,4	22,4	23,0	23,6	22,0	22,6	22,5	23,1	23,7
	8H	22,2	22,7	22,8	23,2	23,8	22,4	22,8	23,0	23,4	24,0

### Variations with the observer position for the luminaire spacings, S:

S = 1.0H	0,1 / -0,1	0,1 / -0,1
S = 1.5H	0,1 / -0,2	0,1 / -0,2
S = 2.0H	0,4 / -0,4	0,4 / -0,4

## Coefficients of Utilization

Ceiling reflectance	80			70			50			30			10			0		
Wall reflectance	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
Floor reflectance	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0
RCR	(RCR: Room Cavity Ratio)																	
	Room Values are expressed as percentage of Lumen delivered to the task surface																	
0	119	119	119	119	116	116	116	116	111	111	106	106	106	102	102	102	99	
1	108	103	99	95	105	101	97	93	96	93	90	92	90	87	89	87	85	82
2	98	90	83	77	95	88	81	76	84	79	74	81	76	72	77	74	70	68
3	89	78	70	63	87	77	69	63	74	67	62	71	65	60	68	63	59	57
4	82	69	60	54	79	68	60	53	65	58	52	63	57	52	61	55	51	49
5	75	62	53	46	73	61	52	46	59	51	45	56	50	45	55	49	44	42
6	69	56	47	40	67	55	46	40	53	45	39	51	44	39	49	43	39	36
7	64	50	42	35	62	50	41	35	48	40	35	46	40	35	45	39	34	32
8	60	46	37	31	58	45	37	31	44	36	31	43	36	31	41	35	31	29
9	56	42	34	28	54	42	34	28	40	33	28	39	33	28	38	32	28	26
10	52	39	31	26	51	38	31	25	37	30	25	36	30	25	35	29	25	23

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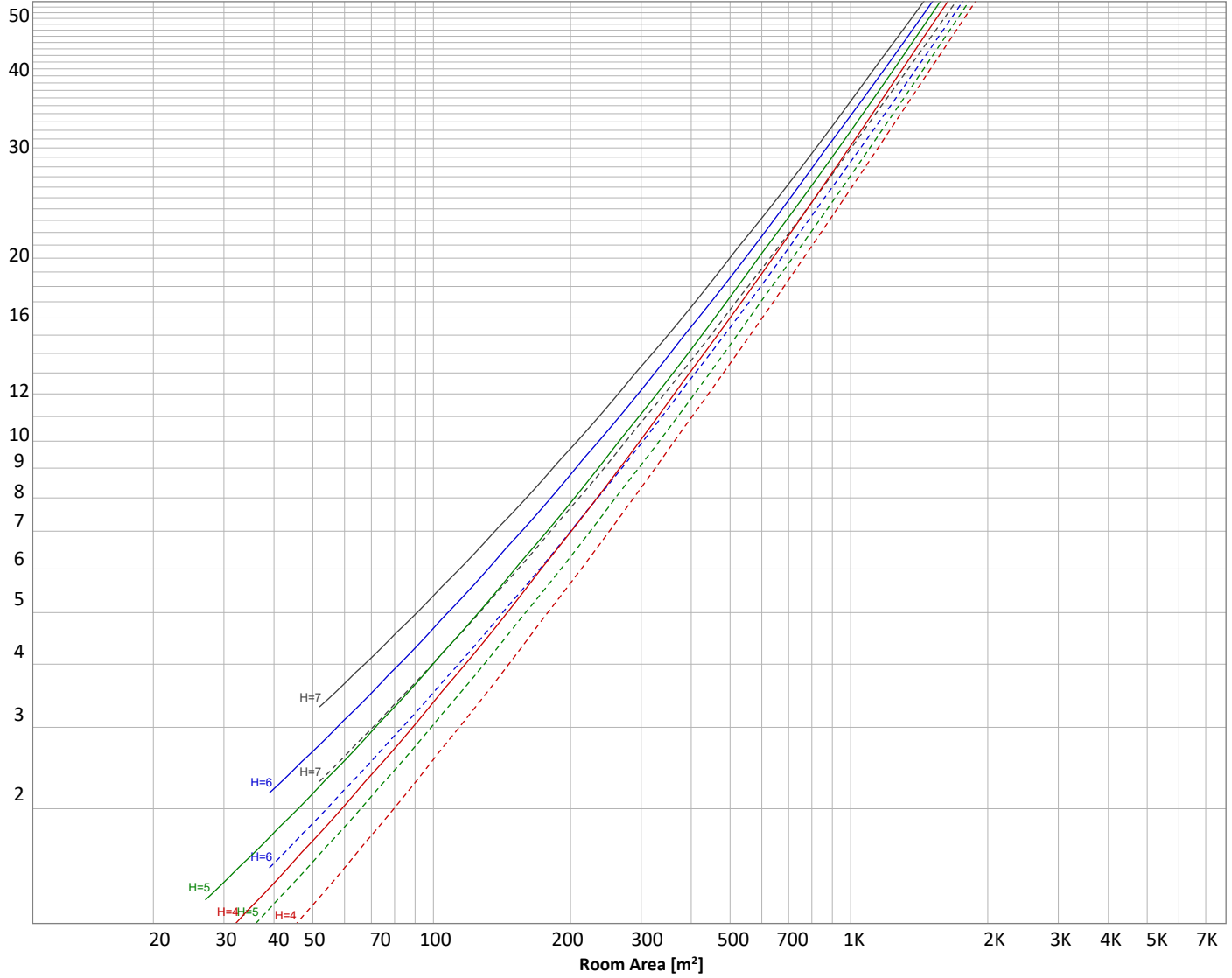
Operator:



## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 4080 lm	$\rho(\%)$			
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
H <sub>work</sub> = Work area height from floor =	0.00 m	-----	70	50	30
E <sub>work</sub> = Average lux on work area =	100 lx	_____	50	30	20

### Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
130 lm	372 lm	567 lm	688 lm	721 lm	659 lm	512 lm	308 lm	101 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
4,77 lm	2,60 lm	3,07 lm	3,15 lm	3,08 lm	2,78 lm	2,17 lm	1,38 lm	0,476 lm

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## Outdoor Light Planning

### Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	130 lm	3,2%
10-20°	372 lm	9,1%
20-30°	567 lm	13,9%
30-40°	688 lm	16,9%
40-50°	721 lm	17,7%
50-60°	659 lm	16,1%
60-70°	512 lm	12,5%
70-80°	308 lm	7,6%
80-90°	101 lm	2,5%
90-100°	5 lm	0,1%
100-110°	3 lm	0,1%
110-120°	3 lm	0,1%
120-130°	3 lm	0,1%
130-140°	3 lm	0,1%
140-150°	3 lm	0,1%
150-160°	2 lm	0,1%
160-170°	1 lm	0,0%
170-180°	0 lm	0,0%
<b>Total</b>	<b>4080 lm</b>	<b>100,0%</b>

### Intensity peaks

Max intensity	1368 cd
Intensity, 90°	18 cd
Intensity, 0°	1367 cd

### Zonal Lumen summary

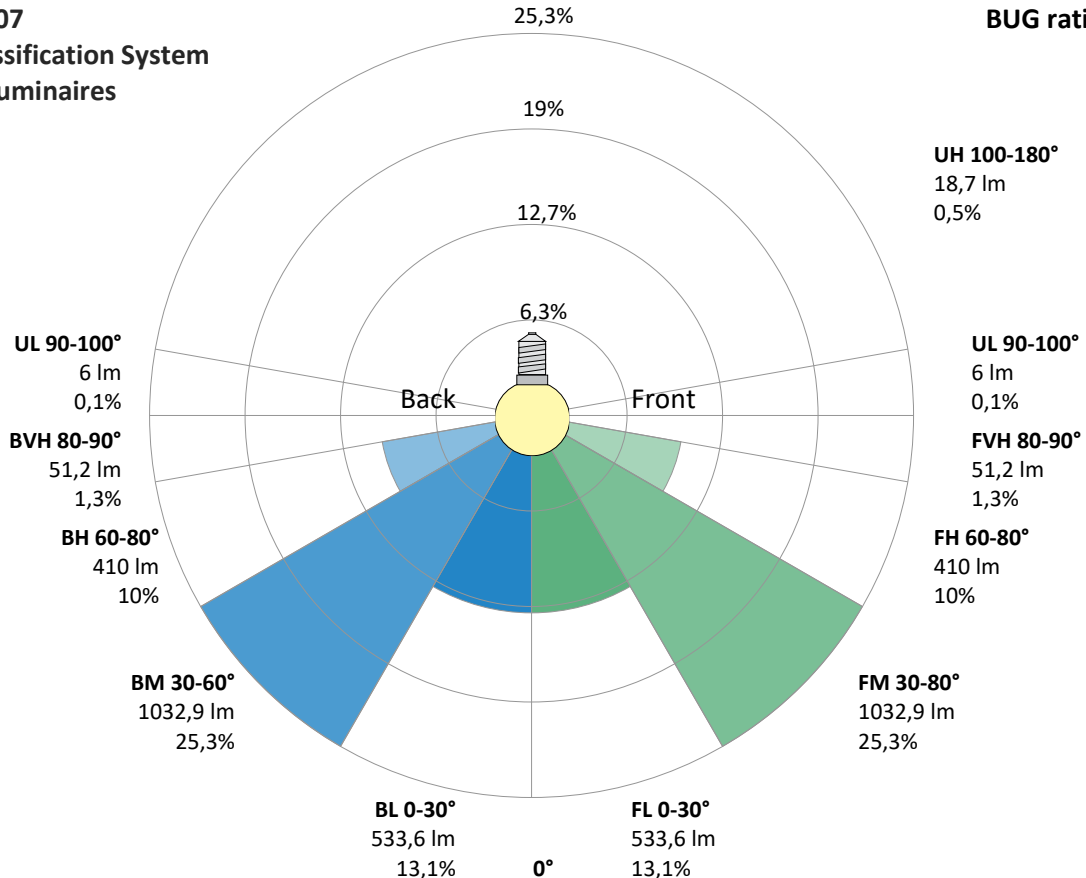
Zone (γ)	Lumen	% Total
0-30°	1068 lm	26,2%
0-40°	1757 lm	43,1%
0-60°	3136 lm	76,9%
60-90°	921 lm	22,6%
70-100°	414 lm	10,1%
90-120°	10 lm	0,3%
0-90°	4057 lm	99,4%
90-180°	23 lm	0,6%
0-180°	4080 lm	100,0%

### BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	534 lm	13,1%
Medium(30-60°)	1033 lm	25,3%
High(60-80°)	410 lm	10,0%
Very high(80-90°)	51 lm	1,3%
<b>Back light</b>		
Low(0-30°)	534 lm	13,1%
Medium(30-60°)	1033 lm	25,3%
High(60-80°)	410 lm	10,0%
Very high(80-90°)	51 lm	1,3%
<b>Uplight</b>		
Low(90-100°)	6 lm	0,1%
High(100-180°)	19 lm	0,5%

## IESNA TM-15-07 Luminaire Classification System For Outdoor Luminaires

**BUG rating B2 U2 G1**



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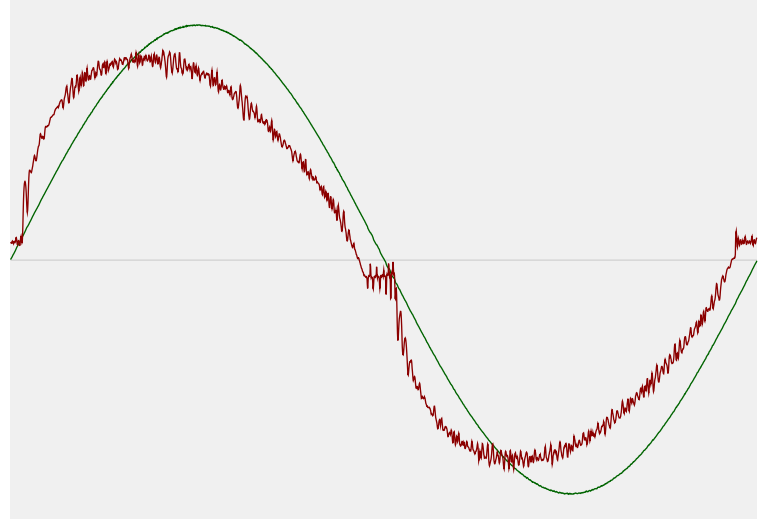


## Power Details

### Input Power

Power feed to light source	41,7 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	230 V
RMS Input current feed, $I_{RMS}$	0,188 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	43,28 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,96
Total harmonic distortion of the current	10,74%
Total harmonic distortion of the voltage	0,12%

### Input Power Curve



### Efficiency

Radiated power efficiency	30,1%
Lumen efficiency	98 lm/W

## Stabilization Details

### Warmup Conditions

Stable period	15 min
Stable change max	2,0%
Minimum time	15 min

### Color Temperature Change

CCT start	3999 K
CCT shift	+1 K
CCT end	4000 K

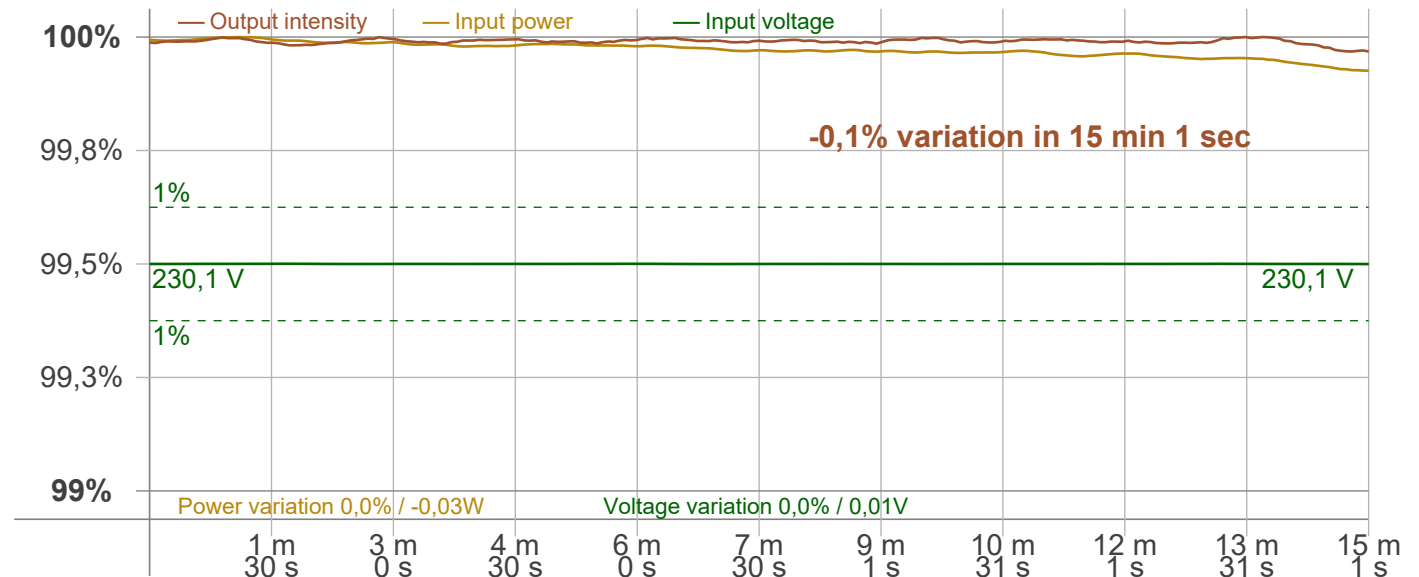
### Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,1%

### Output Change

Output start	4080 lm
Output change	lm
Output end	4080 lm

### Stabilization Curve



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Print date: 19-12-2024

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Measurement tracking No. and Link: [VT241219-001483](#)

Operator:



## Flicker /TLA details

Flicker Meter Type Viso Systems LabFlicker  
 Frequency of input power 50 Hz  
 Flicker/TLA sample rate 20000 samples/s

**Measurement time**  
 PstLM 180 sec  
 All other indices 1,2 sec

### Flicker indices according to Illuminating Engineering Society (IES)

Flicker frequency 6666,67 Hz  
 Percent Flicker 1,21 %  
 Flicker index 0

### Flicker indices according to California Energy Commission (CEC) 2016b

JA8/10 40 Hz 0,02 %  
 JA8/10 90 Hz 0,03 %  
 JA8/10 200 Hz 0,31 %  
 JA8/10 400 Hz 0,39 %  
 JA8/10 1000 Hz 0,47 %

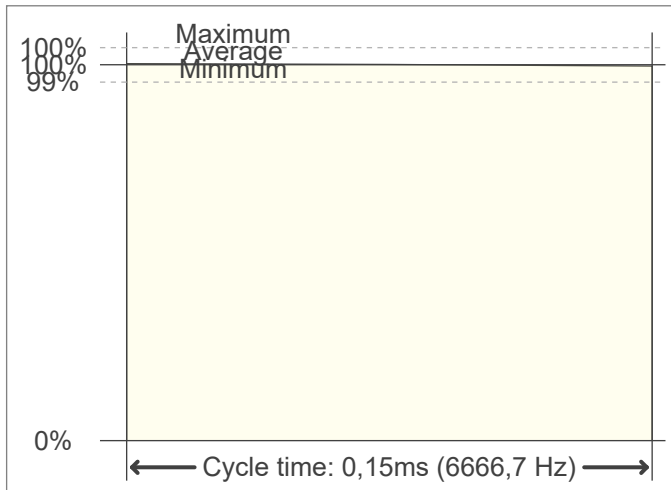
### TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz) 0,01  
 SVM value (80 < F < 2000 Hz) 0,01

### Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp 0,01

### Flicker frame (frame of one flicker period in time domain)



### Flicker FFT (flicker curve in frequency domain)



### IEEE 1789 Frequency/modulation plot

